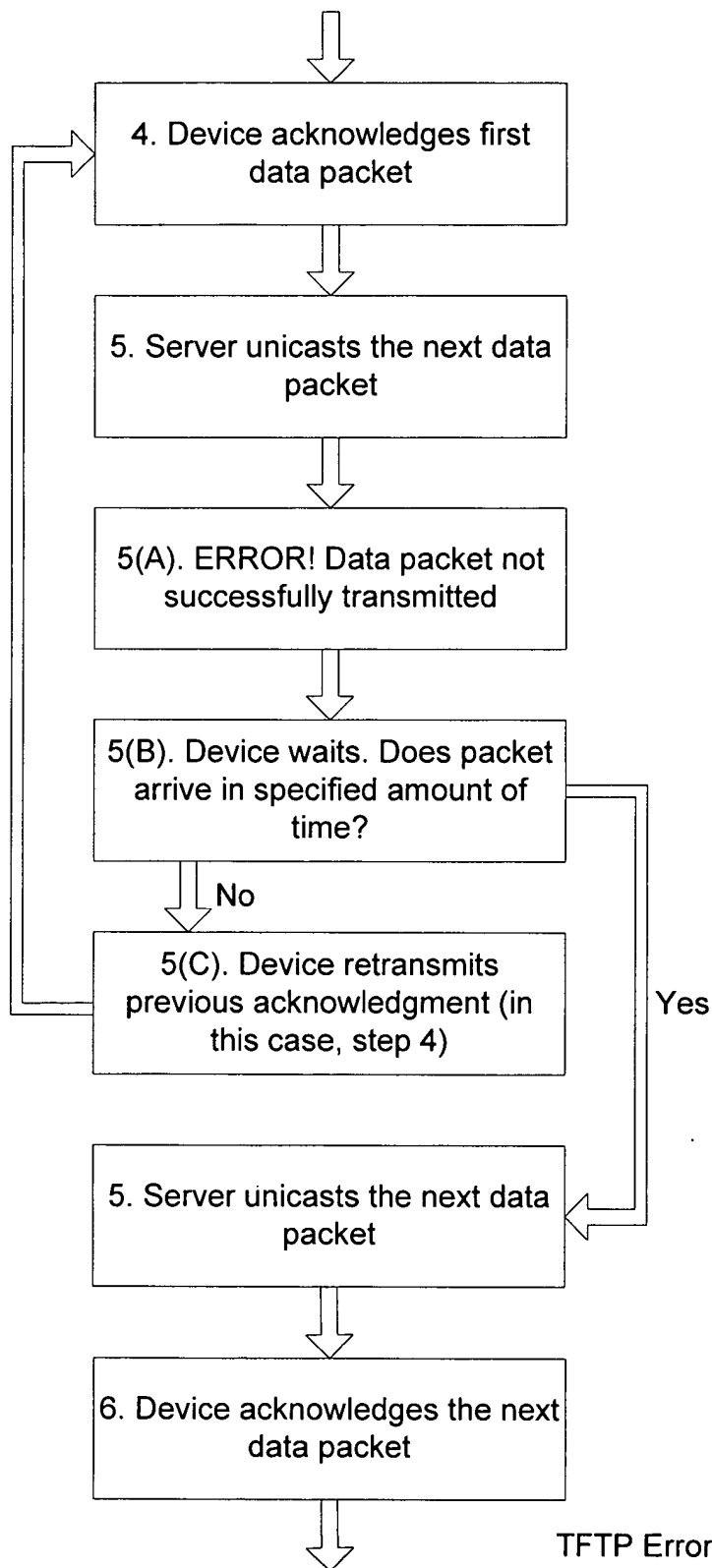


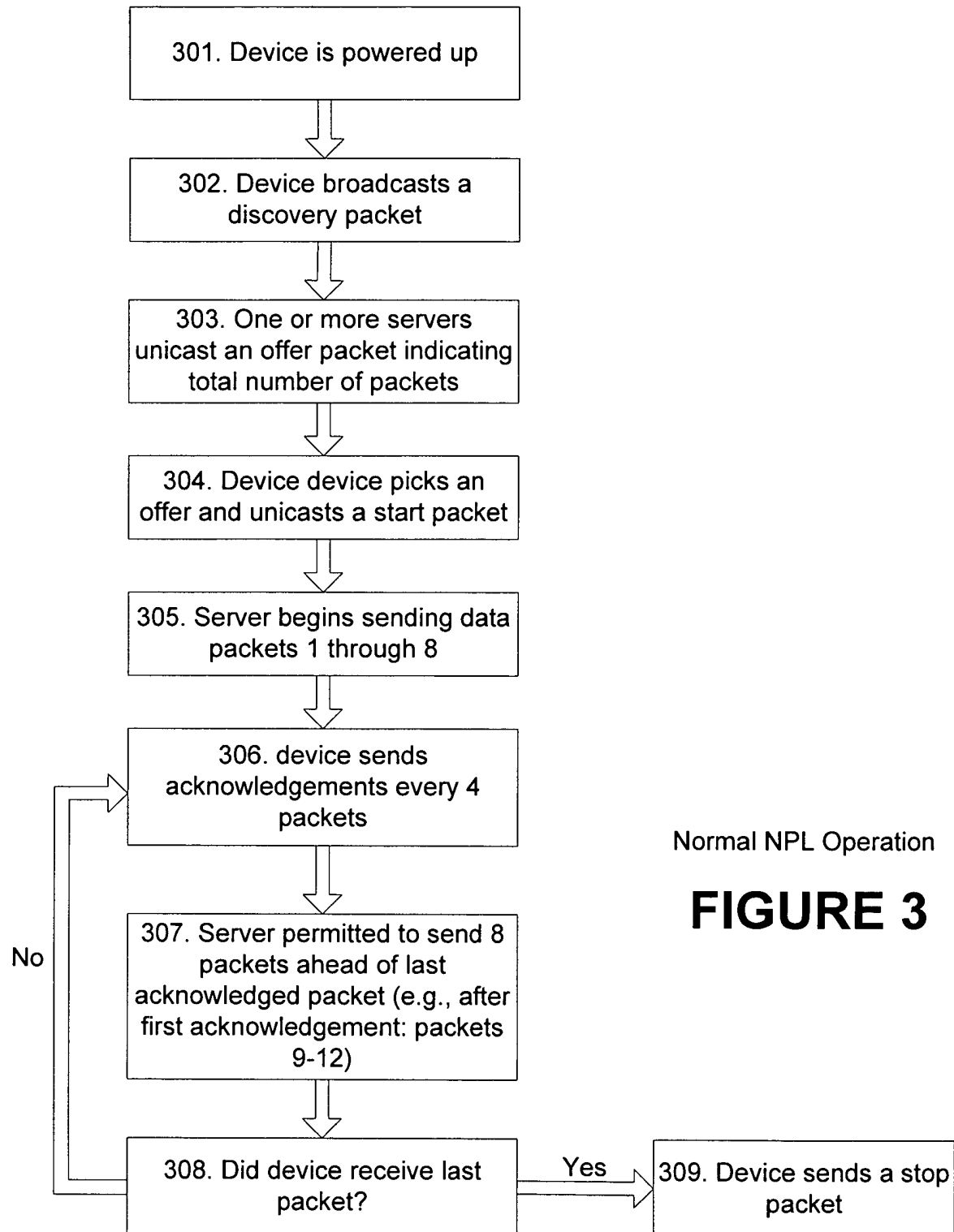
Standard TFTP Operation

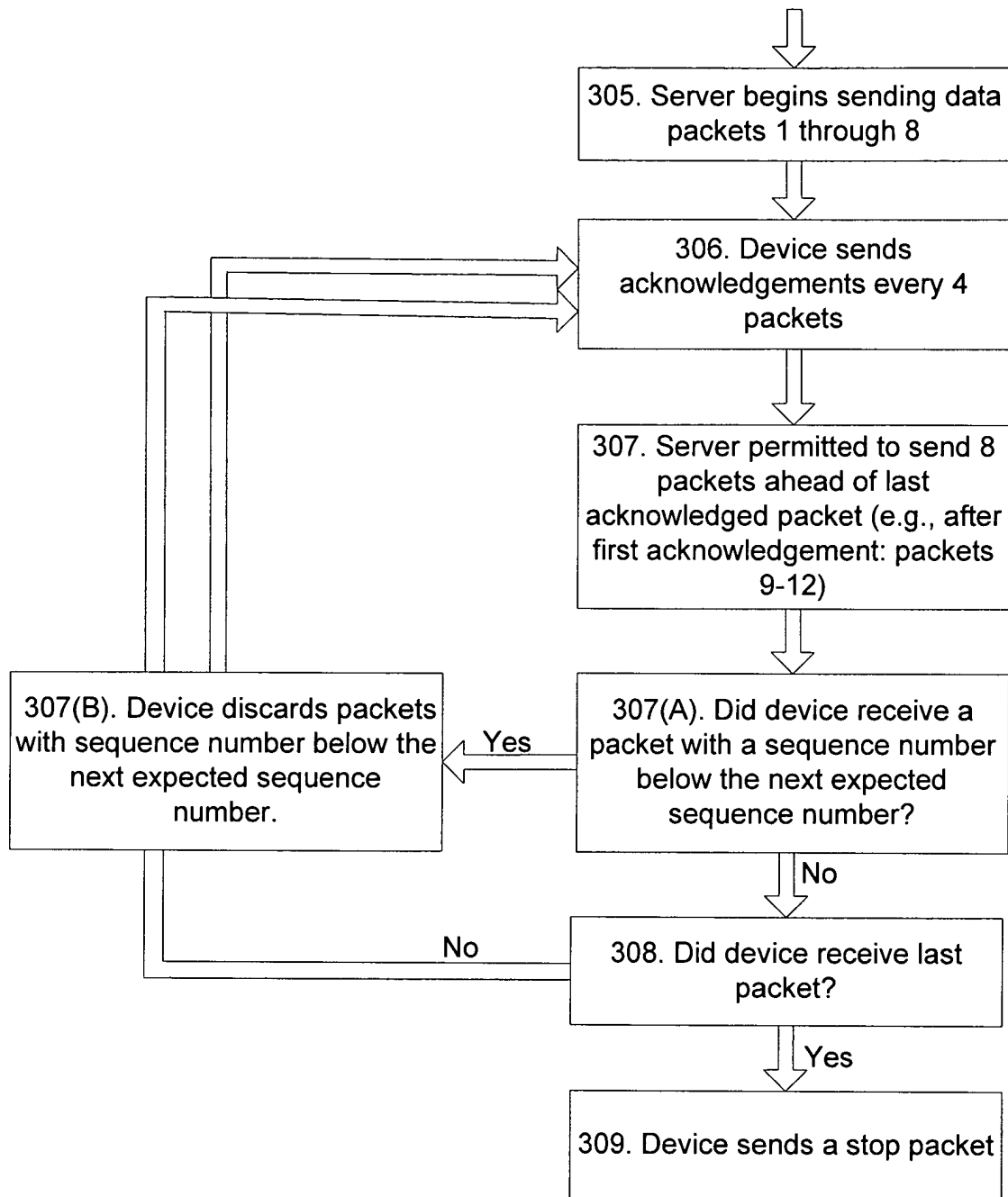
FIGURE 1 (Prior Art)



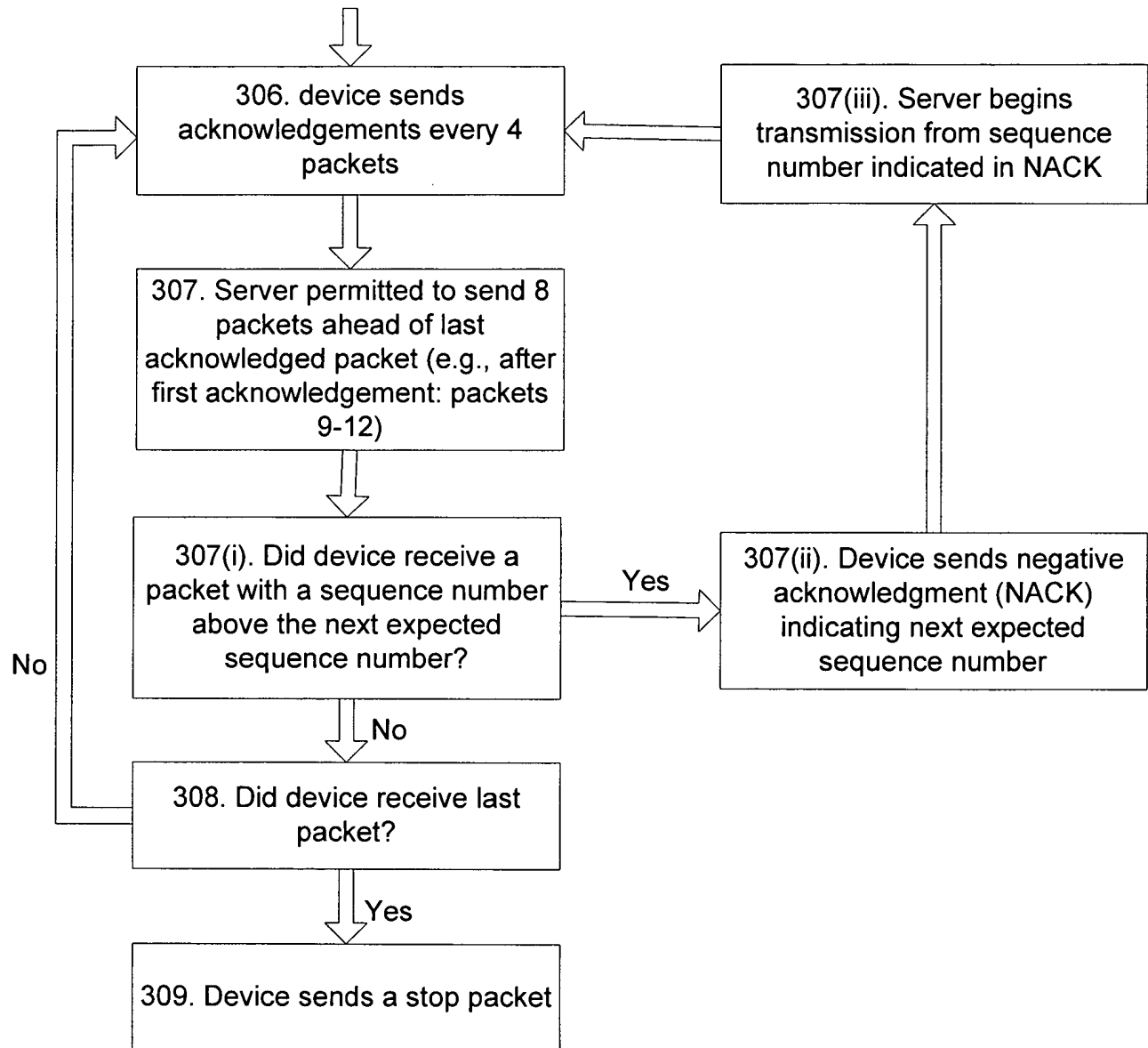
TFTP Error Procedure

FIGURE 2 (Prior Art)



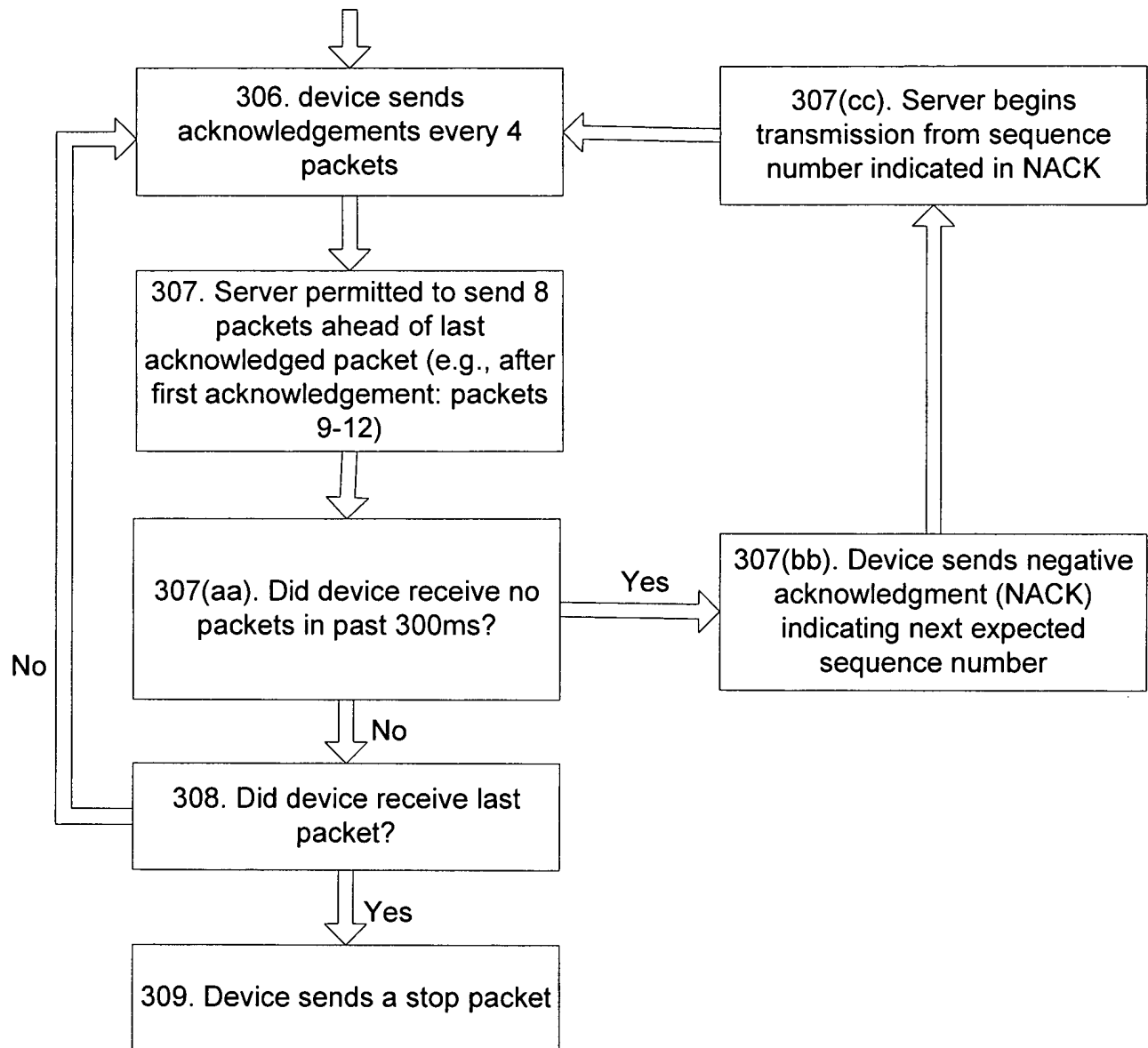


NPL Operation With
Redundant Transmissions
FIGURE 4



NPL Operation With
Skipped Transmissions

FIGURE 5



NPL Operation With
Transmission Failure

FIGURE 6

Device States 700

⁷⁰¹ DV_DISCOVERING (looking for one or more servers)	⁷⁰² DV_STARTING (activating one server to give data)	⁷⁰³ DV_RECEIVING(m) (receiving data from a server, next expected packet is m)	⁷⁰⁴ DV_DONE (download completed)
---	---	--	---

Possible Events 710

⁷¹¹ TIMEOUT(t) (device or server made no state transitions for time t)	⁷¹² RX_DISCOVER (DISCOVER packet received)	⁷¹³ RX_OFFER (OFFER packet received)	⁷¹⁴ RX_START (START packet received)
⁷¹⁵ RX_DATA(n) (DATA packet received with sequence identifier n)	⁷¹⁶ RX_ACK(n) (ACK packet received that acknowledges through packet n)	⁷¹⁷ RX_NACK(n) (NACK packet received that acknowledges all packets up to but not including n)	⁷¹⁸ RX_STOP (STOP packet received)

Device State Transitions 720

Device State ^{721a}	Event ^{721b}		New Device State ^{721c}
^{724a} DV_DISCOVERING	^{724b} RX_OFFER	=	^{724c} DV_STARTING (device sends START packet)
^{725a} DV_DISCOVERING	^{725b} TIMEOUT(t)	=	^{725c} DV_DISCOVERING (device sends DISCOVER packet)
^{726a} DV_STARTING	^{726b} RX_DATA(n)	=	^{726c} DV_RECEIVING(m) (no action taken)
^{727a} DV_STARTING	^{727b} TIMEOUT(t)	=	^{727c} DV_DISCOVERING (device sends DISCOVER packet)
^{728a} DV_RECEIVING(m)	^{728b} RX_DATA(n)	=	^{728c} DV_RECEIVING(m) (action depends on sequence of data—see Fig. 8)

(other state + event combinations result in ignoring the event)

Device States, Possible
Events, and State Transitions

FIGURE 7

DV_RECEIVING(m) Actions 730

Status of next packet n 731a	Device Action 731b
n <= m 732a	Packet discarded, no action taken 732b
n > m+1 733a	Packet discarded, NACK sent 733b
n = m+1 734a	Packet data copied to memory, and if n%4=0, then ACK is sent, if n = last packet, device transitions to state DV_DONE, sends STOP packet. 734b

FIGURE 7A

Server States 800

SERVER_IDLE 801 (server is not sending DATA packets to device)	SERVER_SENDING(n) 802 (server is sending DATA packets to device)
---	---

Server State Transitions 810

Server State 811a	Event 811b		New Server State 811c
SERVER_IDLE 812a	RX_DISCOVER 812b	=	SERVER_IDLE 812c (server sends OFFER packet)
SERVER_IDLE 813a	RX_START 813b	=	SERVER_SENDING(m) 813c (server sends DATA packets DATA(0) - DATA(7))
SERVER_SENDING(m) 814a	RX_ACK(n) 814b	=	SERVER_SENDING(m) 814c (server sends DATA(max(m,n)) through DATA (n+8))
SERVER_SENDING(m) 815a	RX_NACK(n) 815b	=	SERVER_SENDING(m) 815c (server sets m = n, sends DATA (n) through DATA(n+7))
SERVER_SENDING(m) 816a	RX_STOP 816b	=	SERVER_IDLE 816c (no action)
SERVER_SENDING(m) 817a	TIMEOUT(t) 817b	=	SERVER_IDLE 817c (no action)

(other state + event combinations result in ignoring the event)

FIGURE 8

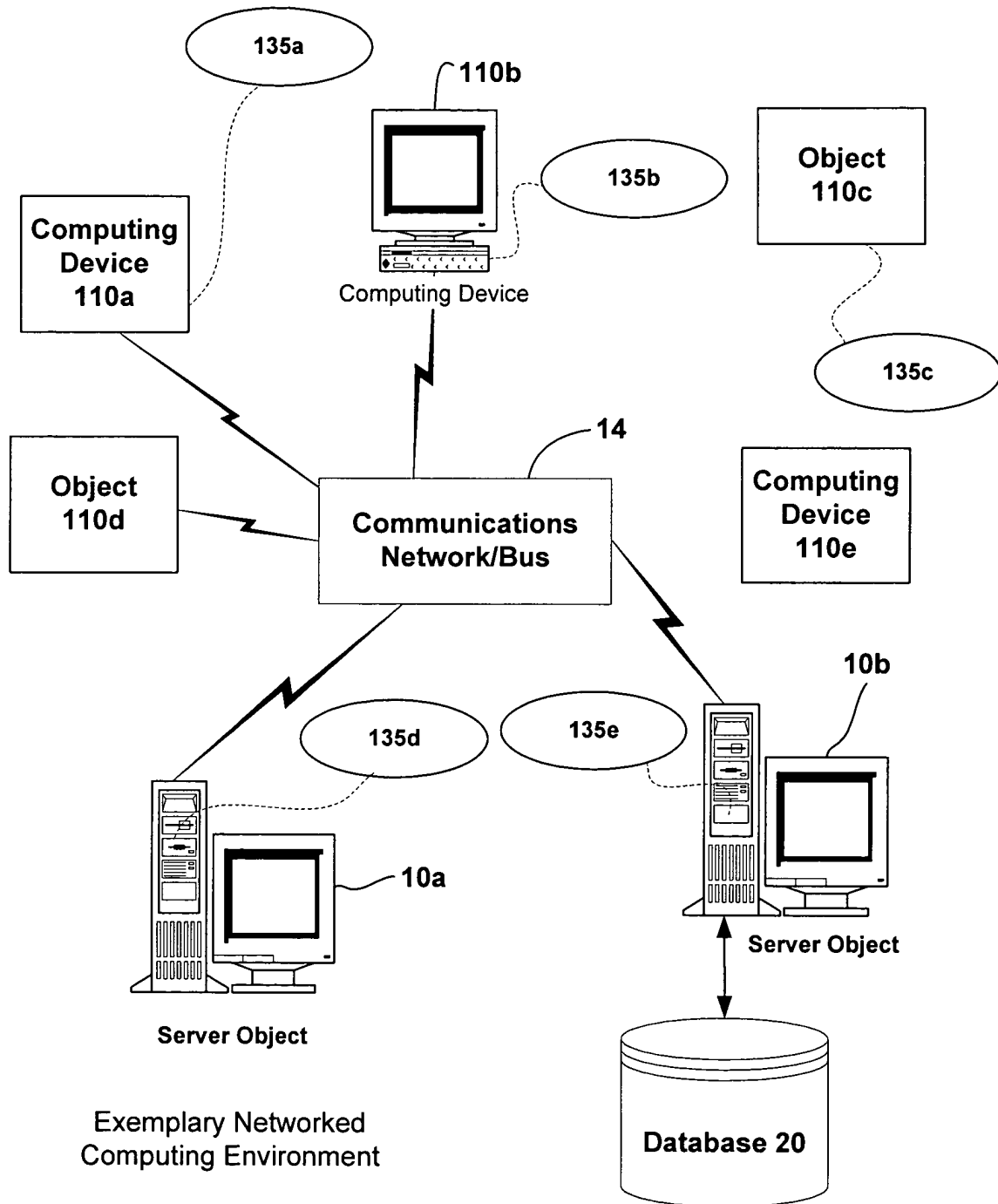


FIGURE 9

Computing Environment 100

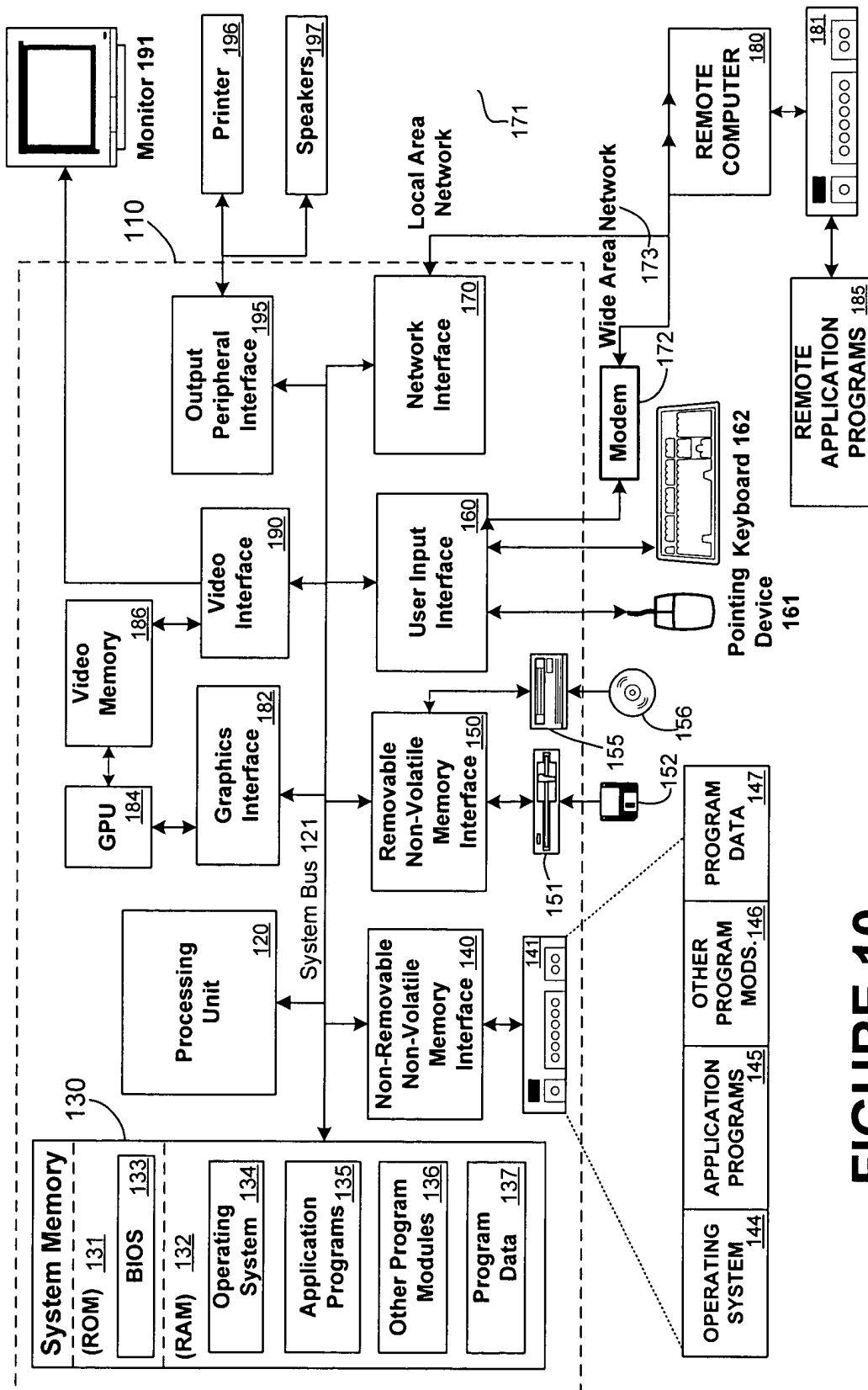


FIGURE 10